

REMARKS

Claims 1-9 remain in the application. The specification and drawings have been amended to include material previously incorporated by reference. Claims 1, 4, and 7 have been amended to correct a grammatical error. No new matter has been added, as specified in the Declaration of Christopher B. Kilner, filed herewith.

Drawings

Applicant acknowledges the requirement for formal drawings and will provide them, as requested, when the application is allowed. New drawings 5-10 have been filed to support the material incorporated into the specification.

Information Disclosure Statement

AGI's STK and its Astrogator module are disclosed for purposes of enablement and best mode and are not prior art in that they are essentially the commercial embodiment of the Applicants' present invention.

Upon inquiry with one of the inventors, it was determined that the prior art GUI discussed in the specification refers to the Swingby program that was developed in 1989 at Computer Sciences Corporation for NASA Goddard Space Flight Center (GSFC). In January 1994, Swingby was used operationally for the Clementine mission. Later that same year, CSC worked with AGI to enhance this program and commercially sell it as a product called Navigator. Swingby continued to be used operationally for the Wind launch in 1994 and the SOHO launch in 1995.

Swingby, and AGI's Navigator product derived therefrom, are prior art products that are not necessarily material to the patentability of the present invention since they are hard-coded and lacking in the features provided by the present invention. As discussed in Applicants' specification, these programs only solved for single step and required that "each problem in a sequence of problems must be profiled and processed manually."

Additionally, Applicants note that these products are not patents or publications suitable for submission in an IDS. Applicants submit that the disclosure in the specification has satisfied the duty of candor.

Claim Rejections - 35 USC § 112 - First Paragraph

Claims 1-9 were rejected under the first paragraph of 35 USC § 112 as failing the enablement requirement since the specification is allegedly “completely silent on the specifics of how the system solves problems in space mission analysis.” Applicants traverse this ground of rejection.

As illustrated by the space simulation patents cited by the Examiner in the Office Action, those of skill in the art are well aware of the equations and algorithms used to simulate the actions of a spacecraft based upon the knowledge of the variables needed to solve the equations and algorithms. This accentuates a major difference between merely simulating spacecraft, where input variables are known, and mission planning, wherein many of the variables must be determined based upon desired results (goals).

Although mission planning uses substantially the same equations and algorithms, it uses them in an inverse manner to solve for input variables based upon the desired output. Part of understanding the present invention is understanding what a “profile” is. As disclosed in the specification at page 5, lines 23-24, “Each profile comprises one or more selected target variables and one or more desired results.” Although the general term “profile” is used in the prior art, such as in the Ellis et al. patent which uses the term in its general sense meaning “characterization” in reference to “satellite mission profiles,” the term is more specifically defined in the present specification, as noted above.

As illustrated in figure 1, the desired results or goals are selected in the best mode STK/Astrogator software with the “Targeting Goal Setup” window of the GUI in which the variables (the “Selected Components”) that will be set for the desired results of a profile are selected from a list of “Available Components.” For this aspect of the invention, the specification teaches, at page 5, line 22 to page 6, line 9:

“Using an intuitive GUI, the invention is embodied to allow the analyst to specify different problems in the form of a set of profiles. Each profile comprises one or more selected target variables and one or more desired results. The user can select any given profile and have the program solve the associated problem. In addition, the user can specify a series of two or more profiles and have the software process them sequentially, as described above.

For example, using the STK Astrogator module, the analyst first creates a space mission analysis scenario. Within that scenario, the analyst sets up a control sequence that simulates the problems to be solved. The invention then allows the analyst, through a GUI, to select all the possible control variables that will be checked in solving the

problems and to define components to be used in defining desired results that represent adequate solutions to the problems.”

At page 7, line 11 to page 8, line 3, it further teaches:

“Referring to **Fig. 1**, the illustrated GUI panel is used for selecting components used in defining desired results (“goals”) for a given problem. The Targeted Goal Setup screen **16** allows a user to establish goals and results for a given profile. A series of available “components” are displayed for the user in an “Available Components” window **10**. This shows a user all of the components that are available for the user to specify, for example Eccentricity, Latitude, Altitude and all other components that a user might wish to vary in performing mission planning and analysis. Placement buttons **18** allow the user to select the components that the user wishes to vary.

When the user selects a component, it is transferred to a “Selected Components” window **12**. Here the user can highlight the selected components for subsequent manipulation or specification. Alternatively, the user can de-select a component using the placement buttons **18**.

When a user highlights a component in the component “Selected Components” window **12**, the details and values associated with the selected component are displayed in a “Component Details” window **14** where they can be specified or modified.

As shown in figure 2, the user continues with creating a profile by specifying “desired values for the goal elements of a mission” (see page 5, line 5) by supplying values for selected goals. The specification teaches, at page 8, lines 4-9:

“Referring to **Fig. 2**, the screen for allowing a user to specify desired values for the goal elements and to determine which are to be used in a given profile is shown. Variables **20** are displayed for the user, as are goals **22** which can be specified by the user for various selected components. Goal elements **24, 26, 28** used in the given profile are marked with an ‘x’. Note that in this example, a value is defined for the element of eccentricity, but that element is not used in the profile.”

As taught in figure 3, the profiles from figure 2 can be added and edited, as discussed on page 8, lines 10-15:

“Referring to **Fig. 3**, the screen to add or modify profiles is illustrated. Profiles are added and can be re-ordered if desired in the Add/Modify screen **30** using the GUI of the present invention. Active profiles are marked with an ‘x’ **32, 34**. In this example, the profile named “Phase-2” is not being run, whereas “Phase-1” and “Phase-3” are being run. This screen also allows a user to edit the profile being run in an Edit screen **36** which allows the user to select the profile to be edited **38**.”

Figure 4 illustrates how mission scenarios are built within the GUI. The left portion of the GUI illustrates a target sequence as part of the mission scenario. The specification teaches, at page 6, line 16 to page 7, line 7:

"The analyst can also flag each profile as active or inactive, directing the software program to run only those that are currently active. Since profiles and sequences thereof can be saved together with the space mission analysis scenario, this is a convenience to the analyst in the event that work must be re-run at a later date.

Once the profiles have been specified, the user can command the software via the GUI to run the profiles. After each profile is run, the invention collects the solution to the profile, and applies it as the initial starting point for the next profile (if appropriate).

The invention also allows the analyst to specify many different sets of profiles for different sub-sequences that make up the overall sequence. The invention further allows one or more sets of profiles to be automatically run as part of another set of profiles. In other words, in running a given sequence that is being investigated as part of a set of profiles, it may be necessary to run a different set of profiles as part of that sequence. The invention allows this "nesting" of profile sets.

When profiles are nested, the invention also allows the analyst to select a desired result of an inner profile to be used as a control variable in an outer profile. It also allows the solution of an inner profile to be used as a result of an outer profile."

The specification teaches further, at page 8, lines 16-18:

"Referring to **Fig. 4**, the Target Sequence window **42** is illustrated. The information in this window shows that three profiles **40** have been defined for this space mission scenario."

One of ordinary skill in the art would understand what a typical space mission problem or scenario is, such as moving a spacecraft from a first orbit to a second orbit. The initial state is known (the first orbit) and the desired goal is known (the second orbit), but the mission problem will include maneuvers that will need to be solved. An analyst of ordinary skill could specify various steps to accomplish the mission, such as i) using a well-known Hohmann Transfer, or ii) using a Fast Transfer orbit maneuver. However, variables such as rocket burn times will need to be determined, as discussed in the background portion of the specification spanning pages 1-2.

With respect to the Examiner's objections as to "how the system solves problems in space mission planning," it is Applicants' position that the specification clearly describes that the system solves problems in space mission planning by providing a simple GUI that allows an analyst to perform the claimed steps. As disclosed in the background portion, i) the sequential profiling and solving of a complex space mission analysis problems carried out by using computer languages and scripts was known in the prior art, and ii) individual profiling of a problem in a GUI was known in the prior art, but each problem in a sequence of problems needed to be profiled and processed manually. Indeed, Applicants have not claimed any new equations or algorithms. The present specification describes a system in which profiles can be built, saved, modified, and linked, so as to allow the a sequence of problems/profiles to be

automatically processed within the GUI, without any need for computer programming, scripting, or manual processing.

Various examples of space problems are disclosed in the originally-filed application. The figures disclose an example of a mission segment wherein the goals are to achieve an inclination of 23.5 and a semi-major axis of 43,125km and the variable that can be varied is DV_X in km/sec (see figure 2). Likewise, page 1, lines 23 to page 2, line 2 disclose another space problem: burn time and direction to obtain a desired orbit. One of ordinary skill in the art would understand the nearly infinite possible space mission problems that could be solved.

However, in the interest of compact prosecution, Applicants have presently included amendatory material that includes appropriate portions of the material incorporated by reference, namely, documentation from the STK Astrogator on-line help system (dated 7 Oct. 1999).

In view of the above arguments, Applicants submit that the application complies with 35 USC 112 and requests withdrawal of the rejections.

Claim Rejections - 35 USC § 112 - First Paragraph

Claims 1-9 were also rejected as being indefinite due to the use of the terms “desired results” and “adequate solution,” that are not defined in the claims. Applicants traverse this ground of rejection.

It is Applicants’ position that the claim limitation “identifying parameters to be used in defining desired results that represent an adequate solution to the problem” in claims 1, 4, and 7 defines the patentable subject matter with a reasonable degree of particularity and distinctness as required by M.P.E.P. 2173.02. The test for definiteness under 35 U.S.C. 112, second paragraph is whether “those skilled in the art would understand what is claimed when the claim is read in light of the specification.” *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576, 1 USPQ2d 1081, 1088 (Fed. Cir. 1986). Indeed, like the patent owner for the claimed wheelchair in *Orthokinetics*, Applicants submit that the terms used in the limitation “identifying parameters to be used in defining desired results that represent an adequate solution to the problem” are as accurate as the subject matter permits.

In the present case, solutions to space problems are “solved” iteratively and do not, *per se*, have an absolute solution, but rather only a solution to the problem that falls within certain bounds, i.e., a solution that adequately meets the parameters of the desired results, such as a particular orbit within certain tolerances of eccentricity, inclination, semi-major axis, etc. The variable nature of “space problems” requires the breadth of the language used in the claims and

the Applicant submits that breadth of a claim is not to be equated with indefiniteness. *In re Miller*, 441 F.2d 689, 169 USPQ 597 (CCPA 1971).

For the above reasons, Applicants submit that the claims meet the requirements for definiteness under 35 U.S.C. 112, second paragraph and requests reconsideration and withdrawal of the rejection.

Claim Rejections - 35 USC 102

Claims 1-9 were rejected under 35 USC 102(e) as being allegedly anticipated by Ellis et al. Applicants traverse this rejection. To anticipate a claim, the reference must teach every element of the claim:

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990). See M.P.E.P. 2131

In the present case, the Office Action merely cites the portions of Ellis et al. that mention space missions, Satellite Tool Kit, and simulation, and erroneously alleges that the disclosed mission rehearsals anticipates mission planning, that the disclosed anomaly isolation anticipates solving problems, and that the “simulator disclosed by Ellis allows the user to identify and select parameters and control variables via a command sequencer module.” This rejection is meritless. It completely fails to consider *the distinction between simulation and mission planning*, as discussed above.

For example, a mission rehearsal is a *simulation* in which all input and controls have been *previously determined* and are *tested*. It is the *mission planning* stage in which these inputs and controls are *determined*. Clearly, the mission rehearsal of Ellis et al. is not a disclosure of mission planning as claimed. Likewise, the single reference to “anomaly isolation” (e.g., simulation to reproduce an actual failure, such as recently was done with the Mars Pathfinder mission) has nothing to do with presently claimed invention.

The only disclosed user control in Ellis et al. is of telemetry data streams. The only disclosed user input in Ellis et al. is of ground station commands. Indeed, nowhere does Ellis et

al. teach or fairly suggest the following claimed limitations, either individually or in combination:

- **setting up a control sequence that simulates a problem to be solved** in the space mission;
- **selecting control variables** to be checked in solving the problem;
- **identifying parameters to be used in defining desired results that represent an adequate solution to the problem;**
- **establishing profiles for each particular sub-problem of the problem to be solved;** and
- **running simulations for each of the established profiles** to provide a result representing **a solution to the problem to be solved.**

Claims 1-9 were further rejected under 35 USC 102(b) as being anticipated by the MARC publication (hereinafter, MARC). As with Ellis et al., MARC is drawn to simulation, not mission planning. Although it can solve and display the results of thrust inputs, it is merely doing simulation and not solving a problem based on a desired result. It cannot solve for how long the user should apply the thrust to obtain a desired result, but only solve for the results obtained from the applied thrust. As such, it also fails to teach or fairly suggest the claimed:

- **setting up a control sequence that simulates a problem to be solved** in the space mission;
- **selecting control variables** to be checked in solving the problem;
- **identifying parameters to be used in defining desired results that represent an adequate solution to the problem;**
- **establishing profiles for each particular sub-problem of the problem to be solved;** and
- **running simulations for each of the established profiles** to provide a result representing **a solution to the problem to be solved.**

In view of the above arguments, Applicant respectfully submits that claims 1-9 are novel and non-obvious over the cited prior art.

Conclusion

For the reasons cited above, Applicants submit that claims 1-9 are in condition for allowance and requests reconsideration of the application. If there remain any issues that may be disposed of via a telephonic interview, the Examiner is kindly invited to contact the undersigned at the local exchange given below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Christopher B. Kilner". The signature is fluid and cursive, with a long horizontal stroke at the end.

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